BED-CEIA Incidence and Adjustment Formula

Symbols for Variables:

Values are calculated:

I = Incidence (number of new infections per year per 100 persons at risk)
F = Adjustment factor for sensitivity/specificity adjustment.

Values are measured in a cross sectional survey:

T = total people in the survey
P = total testing HIV positive
N = total testing HIV negative
R = total testing recent in the BED-CEIA

Values are imputed from independent calibration studies:

w = window in days
(maximum duration of seropositivity in those testing recent).
α = sensitivity of BED test for detecting recent (< *w*) infection.
β = specificity of the BED test over the period > *w* to < 2*w*.
γ = specificity of the BED test over the period > 2 *w.*
ε = false recent rate in those with long term (> 2 *w*) infection.
NOTE: $\varepsilon = (1 - \gamma)$ and $\gamma = (1 - \varepsilon)$

Unadjusted Incidence Formula (annualized):

$$I = \frac{(365/w)\,R}{N + (365/w)(R/2)} \times 100$$

Sensitivity/Specificity Adjustment (McDougal et al):

1. Calculate the Correction Factor F

$$F = \frac{(R/P) + \gamma - 1}{(R/P)(\alpha - \beta + 2\gamma - 1)}$$

2. Multiply R in the incidence formula by F:

$$I = \frac{(F)(365/w)\,R}{N + (F)(365/w)(R/2)} \times 100$$

Specificity Adjustment (Hargrove et al):

1. Enter data into the following:

$$I = \frac{R - \varepsilon P}{(R/2) + N(w/365) - \varepsilon N - \varepsilon(P/2)} \times 100$$

Notes:

- Values for the imputed variables are based on analysis of 2532 specimens from 1192 people with known (approximate) date of seroconversion. As of January 2006, the values are:
  - w = 155 days
  - $\alpha = 0.7682$
  - $\beta = 0.7231$
  - $\gamma = 0.9443$
  - $\varepsilon = 0.0557$

  The values will be periodically revised with acquisition of new data

An Excel spreadsheet is available for calculating unadjusted incidence and incidence calculated with the two adjustments. Enter study variables T, R, N, and P as indicated; the values of the imputed variables are already entered. For a copy of the spreadsheet and technical assistance on how to use the spreadsheet, please contact Bharat Parekh (BParekh@cdc.gov) or Andrea Kim (AAKim@cdc.gov).